R E P O R T R E S U M E S

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IMPROVING THE QUALITY OF TEACHER PERFORMANCE BY THE USE OF THE VIDEO TAPE RECORDER. FINAL REPORT.

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REPORT NUMBER BR-5-0861 PUB DATE DEC 67
GRANT OEG-7-12-039
EDRS PRICE MF-$0.25 HC-$1.64 39P.

DESCRIPTORS- *METHODS RESEARCH, *STUDENT TEACHERS, TEACHER EDUCATION, STUDENT TEACHER RELATIONSHIP, *VIDEO TAPE RECORDINGS, KINESCOPE RECORDINGS, *FEEDBACK, CYBERNETICS, OBSERVATION, *BEHAVIOR RATING SCALES, SELF EVALUATION, CONCEPT FORMATION, LABORATORY EXPERIMENTS,

IN TWO EXPERIMENTS, FEEDBACK WAS CONCEPTUALIZED AS A CYBERNETIC PARADIGM INVOLVING STUDENT-PROFESSOR INTERACTION, AND WAS USED VIA VIDEO TAPE TO IMPROVE TEACHING OF A FIVE MINUTE LESSON BY STUDENT TEACHERS. IN EXPERIMENT I, FOR THE 24 STUDENTS EQUALLY DIVIDED INTO FEEDBACK AND NO FEEDBACK GROUPS, NO SIGNIFICANT DIFFERENCES APPEARED IN 29 PERFORMANCE FACTORS AS RATED BY METHODS TEACHERS. THIS WAS EXPLAINED AS AN ERRONEOUS STATISTICAL COMPARISON THAT RESULTED IN A SLEEPER EFFECT, AND ALSO BY EXTREME VARIATIONS IN FEEDBACK CONTENT. IN EXPERIMENT II, FOR THE 19 STUDENTS DIVIDED INTO IMMEDIATE AND DELAYED FEEDBACK GROUPS IN FIVE TRIALS, EACH FOLLOWED BY SELF-EVALUATION, NO SIGNIFICANT DIFFERENCES APPEARED AMONG A HUNDRED COMPARISONS OF COVARIATES. THIS WAS INTERPRETED IN TERMS OF LOW INTERRATER CORRELATION, AND POOR CONCEPTUALIZATION. (LH)

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EM 06686

FINAL REPORT
Project No. 311 (5-0861-4-20) - 24
Grant No. 7-12-039

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U.S. DEPARTMENT OF
HEALTH, EDUCATION, AND WELFARE

Office of Education
Bureau of Research

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OFFICE OF EDUCATION

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December 1967

The research reported herein was performed pursuant to a grant with the Office of Education, U.S. Department of Health, Education, and Welfare. Contractors undertaking such projects under Government sponsorship are encouraged to express freely their professional judgment in the conduct of the project. Points of view or opinions stated do not, therefore, necessarily represent official Office of Education position or policy.

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ACKNOWLEDGMENTS

We wish to acknowledge, first, the assistance of the many persons who sustained this study but who, for different reasons, must be unnamed. They include our "subjects," the student teachers of the School of Education; colleagues in the Audio Visual Center, School of Education and Radio and Television Department; members of the Administrative Staff of Dyer, Binford, Bloomington and University Junior High Schools and the 7th and 8th grade pupils of these schools.

Then we wish to thank: Dean Philip Peak for unstinting encouragement of our efforts and for personal participation as a mathematics methods teacher; Professors Virgil Schooler, Dorothy G. Kelley, Dotty L. Lackey, Evangeline G. Parker, Ingrid Strom, Earl Floyd, Newell H. Long, John P. Lunstrom, Frederick G. Mills, and Prevo L. Whittaker for assuming the responsibility, as methods teachers, of defining "right" and "wrong," "good" and "poor," to the student teachers in this study; Professor M. McGlasson for his assistance in communicating with students and methods teachers and coordinating the conduct of experimental sessions; Professor Lawson Hughes for analyses of data under difficult, post-design circumstances, and finally, to Research Assistants, Suchoon Mo, Fath Elbab Sayed, William G. Henry and James Pigg for helping whenever and wherever they were needed.

H.A.B.

INTRODUCTION

Abstract

Problem-Purpose: At the practical level of definition, the problem was how to enable a student teacher (ST) to improve his teaching of a five-minute "sample" lesson; the purpose was to test two video tape recorder-aided methods of providing "immediate feedback" to the ST to so enable him.

Conceptual Framework: A cybernetic paradigm was described in which the problem was viewed as a particular "control" operation of an instructional communication system in order to provide some analogical validity to the construct of "feedback" and to the consequent hypothesis that the video tape (VT) feedback in the system would improve ST performance.

Method: Two experiments were conducted: In the first, 24 students received VT feedback immediately after each of three video taped trial performances. Following the third feedback session, a fourth (test) performance was recorded. Another group of 24 students followed a similar sequence of trial and test sessions, but were not shown video tape recordings of their performances. A group of three judges (methods teachers) rated the test performances of both groups.

In the second experiment, nineteen students were divided into early and late feedback groups: the former receiving VT feedback during the first three of five trials, the latter, during the third through fifth trials. A variety of comparisons were made of the performances at different trials based upon ratings made by judges and student teachers themselves.

Results: In general no statistically significant differences were found.

Conclusions: The statistical results permit no expression of confidence in the significance of the VT feedback. The execution of the study was full of difficulties, however, suffered from an oversimplified concept of "feedback," from a conflict between the theoretical, research and developmental aspects of the problem and left much to be desired in the area of measurement and control. Consequently, the results should only increase further interest in the study of the problem.

Problem-Purpose

The relationship between the perceived problem and the conceived purpose of this study can be described at various levels of abstraction. At the most general level, the problem is the need for a science of education; the purpose is to contribute to the building of one based on developments in educational technology. In a progress report of this study presented at the December 1960 National Convention of the American Association for the Advancement of Science, this problem-purpose relationship was stated as follows:

> "It may, perhaps, be taken for granted that a study presented at the American Association for the Advancement of Science is related to the advancement of a scientific endeavor. However, when this field of endeavor is one about which it can be said that it is more appropriately described as folklore than as science (1) it is fitting that nothing be taken for granted and that a few words be said about that relationship."
>
> "You may recall reading in a recent issue of *Science*, the report of the Panel on Basic Research and Graduate Education of the President's Science Advisory Committee. In it was the statement that 'we do not believe in artificial separation between basic and applied research or between science and engineering' (2). If one may indeed approach science through engineering, as implied in this statement, then it is suggested that this study is related to the advancement of education-as-a-science via the concept of 'educational engineering' (3)."

Less grandiously, but still at a broad level, the problem is the difficulty of communication between methods teachers and their students; the purpose is the "engineering" of an instructional system to increase control of this process. A more literal sense of engineering is implied, as expressed in the same report mentioned above.

> "Now, the term 'engineering' has frequently been used to a figurative sense in connection with education. Most recently and most notable, perhaps, one might cite W. K. Estes, who in his article in the *Encyclopedia of Educational Research* refers to the field of education as 'this engineering discipline' (4). However, the term can now be used in the literal sense as it appears in the responses of certain areas of training and education to the

> theory and the technology heralded by such prophets as N. Wiener (5). These responses to the basic notion of 'control and communication in man and machine' range from home-made teaching machines designed for a simple pupil-machine 'system' to elaborate intra- and inter-state-institution-wide complex of systems, technological and otherwise (6)."

At the simplest and most "practical" level, the problem is how to enable a student teacher to improve his teaching of a five-minute, "sample" lesson; the purpose is to test a machine-aided system providing an "immediately" available record of the teaching performance, this record to be used as a means of improvement of analysis and performance of the teaching.

In the oversimplified, experimental sense of the study, the independent variable is video-taped "feedback"; the dependent variable, student-teacher performance.

Conceptual Framework

Studies directed toward public explanation necessarily involve some conceptual framework, schema, paradigm, model, etc. Generally, the nature of the framework is vague and must be inferred. There is reason to believe, however, that whatever its limitations, the framework should be described as explicitly as other conventionally explicit components of the study, such as "materials," "methods," and "procedures."

Consider, then, the problem situation. It is common practice in methods classes to ask each student teacher (ST) to present a short lesson before the class. In presenting the lesson, the ST's behavior is presumably guided by a concept of teaching behaviors inferred from the methodological principles described in his textbooks and explained by his methods teacher (MT). Following the presentation, MT and ST discuss it, trying to relate the conceptual aspects of teaching with the overt aspects in which they were expressed. The improvement of this practice is of considerable importance for it contains communication problems basic to many other situations in which student teachers and beginning teachers are "evaluated." In what way, then, can we "look" at this sequence for a general approach to improvement of both the analysis and performance of an act of teaching?

A number of research paradigms of teacher-student interactions described in the Handbook of Research on Teaching (7) now involve concepts taken from "cybernetics"--the theory of "control and communication in the animal and the machines." This study elects to use a cybernetic paradigm which enables us to view the problem-situation as a particular sequence in the operation of an instructional "communication and control" system. The paradigm emphasizes the general principle that is fundamental in control theory. The principle states that control of the system output is achieved by providing feedback in such a way that the difference between the output and the input tends to be reduced to zero.

What does this mean? The principle is perhaps best illustrated by a physical and mathematical description of the operation of a servomechanism or a negative feedback amplifier. For our purposes, a simplified description of the operation of a home heating system (which is more likely to be familiar), will suffice as an explanatory device.*

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*There are many reasons to question the usefulness of electromechanical paradigms to explain human behavior. The most serious and most difficult to treat are those which indicate that such use will necessarily result in an ultimate "de-humanization" of society. A more immediately relevant question is that of the usefulness of this particular paradigm in contrast with other mechanistic paradigms. Both of these questions would take us into a broader field of inquiry than is legitimately ours at present, but we recognize their existence, validity and importance.

How is the "desired behavior" of a heating system--the attainment of an indicated approximate temperature--achieved? (See Figure 1)

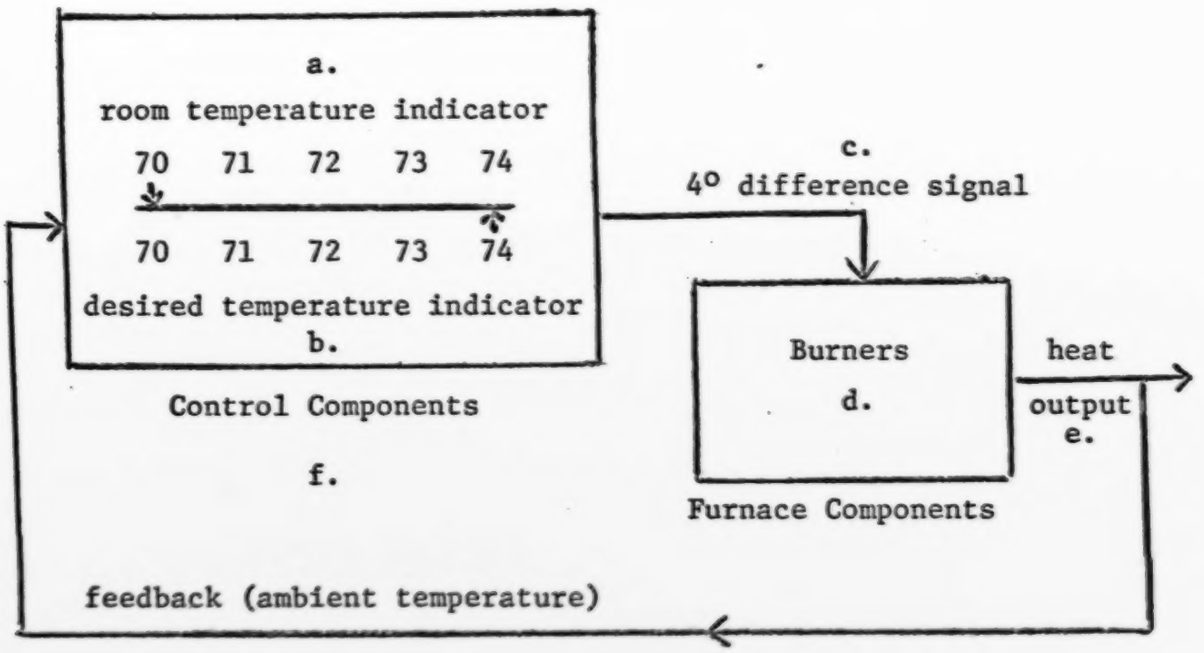

Figure 1. Heating Control System

Let us assume the room temperature indicated by the thermostat is 70°, (a). We wish the room to be warmer--about 74°. By hand we set the desired temperature indicator, (b), to 74°. As a result, we have inserted a 4° "difference" signal (c), into the system. The system seeks to correct or reduce this difference to zero. The mechanical displacement of the control indicator, through intermediate electro-mechanical links, triggers the lighting of the furnace burners, (d). As the heat output, (e), circulates throughout the room, the increasing temperature surrounding the control unit (the ambient or feedback temperature) literally reduces the mechanical displacement of the temperature indicator representing the 4° difference signal. The indicator moves toward 74°, until at approximately zero difference, through the same electro-mehcanical linkage, the gas flow to the burners is cut off. The "desired behavior" has been achieved.

What has this to do with the MT-ST instructional situation? Essentially, it provides a "way of looking" at that situation which clarifies the critical elements for its analysis and control. Further, this way of "looking" via principles applicable to both man and machine, readily permits the introduction of a machine, if necessary, for the improvement of the design of the system as a whole.

In the paradigmatic schema of the ST control system (Fig. 2), below

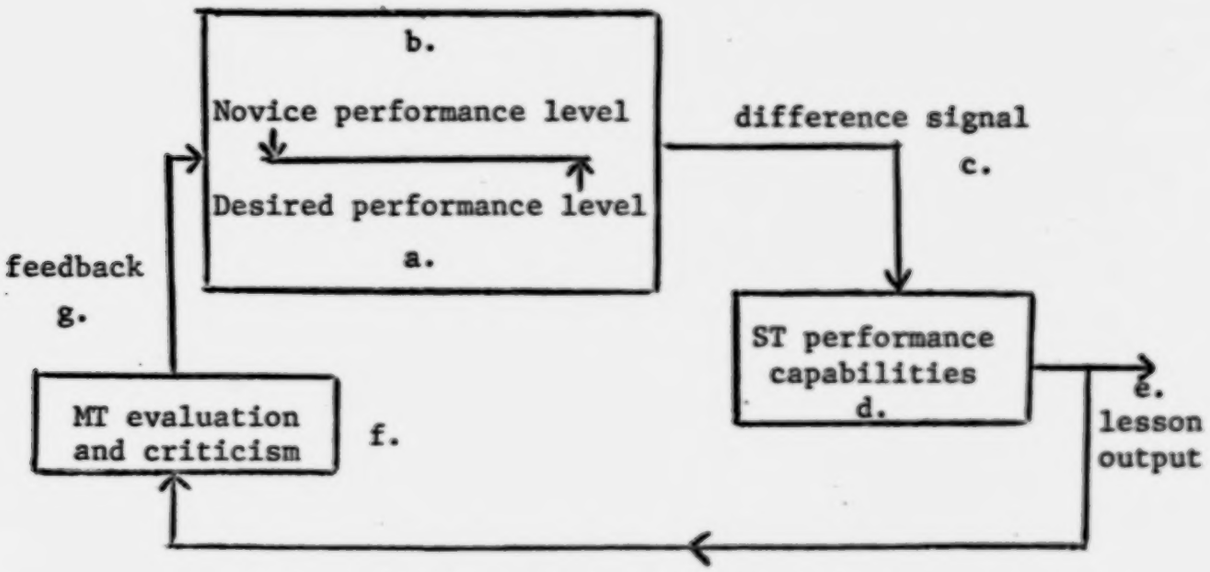

Figure 2. Instructional Control System

the principle of control emerges as follows: As a result of education, training and practice, the MT has some "concept" of what constitutes the "desired performance level" of the ST. By word, by example, by film, by observations, by directed discussion - by teaching -, the MT "sets" the concept of the desired performance level (a) for the ST. The lack of training and experience by the ST, his status as a "novice," presumably places the performance level of the ST (b) "below" that of the desired level. A comparison of these two levels presumably takes place "within" the ST. The difference between the students immediate novice performance level and the MT desired performance level constitutes the perceived difference signal, (c), which the ST seeks to "reduce" by subsequent operations.

The ST's performance capability (d), determines the quality of the lesson output (e). As a result of the MT's perception and evaluation of this output, a portion of it, a "correction" of "feedback" signal (g) is now "filtered" back to the ST's initial perception of his novice performance level. The major component of the correction signal is presumably the selective (filtered) criticism of the MT*. If there has been a sufficient output of correct behaviors by the ST, the MT feedback reflects it by indicating that the ST performance level is in some "degree" closer to that of the desired level.

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*Obviously, other components exist, e.g., the verbal and nonverbal behavior of the ST's "pupils" and the ST's own "self-consciousness" during the course of and subsequent to the lesson.

Two components of this feedback signal seem amenable to improvement with machine assistance: one relates to the nature of the signal, the other to the time delay in its availability. The conventional post-performance discussion feedback is highly unreliable information since it is based on retrieval of information stored in individual codes in the memories of MT and ST. Because of inherent biological and psychological limitations, the MT and ST must each, separately, store a unique, intermittent, biased, coded sample of a complex, verbal-pictorial, integral and, until recently, non-replicable event.

It would be desirable, therefore, to have a means for recording the ST performance as it was being given, and to be able to replay it immediately afterwards for "immediate feedback." The latter requirement is an implication of our paradigm but is even more strongly supported by research findings in the effectiveness of "immediate knowledge of results" and "immediate reinforcement" (with which the term "immediate feedback" is frequently equated).

The "old" sound film and the more recent television variant, the Kinescope, are both means for accomplishing the recording of the ST performance, but they introduce a film processing time lag of, normally, several days between performance and replay. The advantage of the TV camera-video tape recorder is that it provides both recording and immediate playback capabilities. Consequently, it was used in this study.

Our instructional system could then be schematized as in Fig. 3.

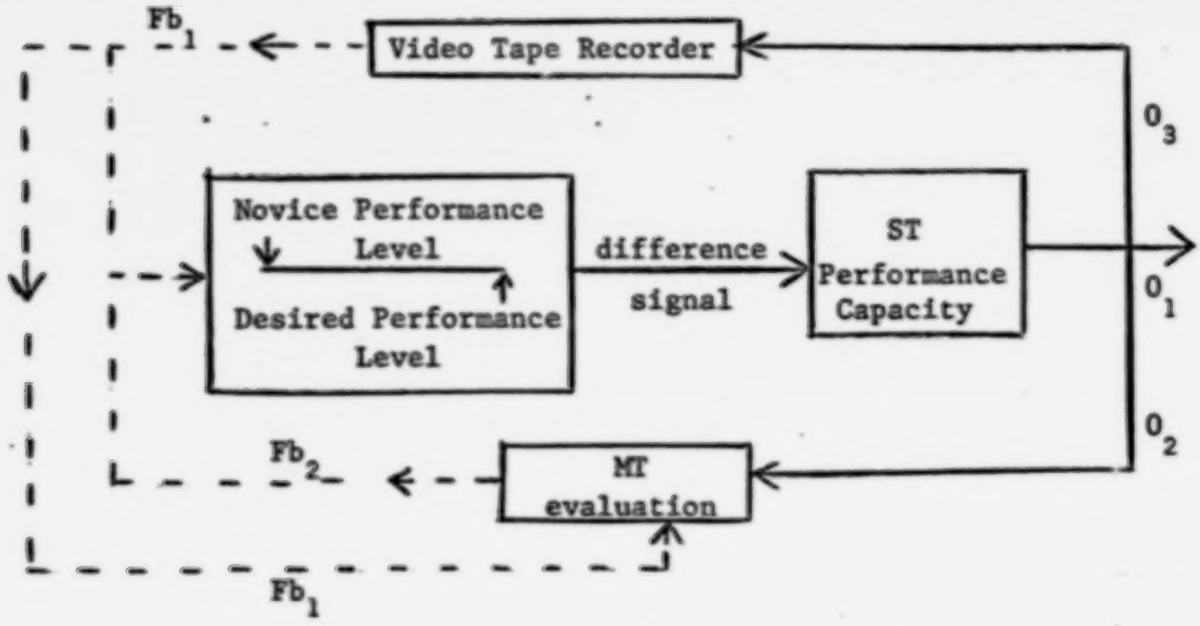


Figure 3. Instructional Control System with Video Tape Feedback

The signals O_1, O_2, O_3 represent the output which can be perceived by the pupils, MT and video-tape recorders, respectively, during the ST's initial performance. The dotted feedback lines represent the components of a subsequent ST performance. Fb_1, the video-tape "replay" is perceived by both MT and ST. It serves as a direct input to the ST and as a stabilizing and "noise-limiting" generator of Fb_2, the "constructive criticism" of the MT.

As a result of the "externalization of the "memory" of the output in the video-tape recorder, then, we have available a signal generator which can be employed as a reliable reference to further ST-MT communication and control. It is interesting and provocative to note that if, for a given aspect of teaching, we can assume a) an unambigious set of operations which defines the desired level of performance and b) a stage of learning by the ST in which he can discriminate between his own novice level and the desired level, then we can logically eliminate the use of the MT for that aspect. We would, in effect, have a self-evaluational, self-instructional ST "laboratory" akin to the language laboratory.

In summary, then, this section has described an electro-mechanical system to illustrate a fundamental cybernetic principle and to derive a paradigm for research on a "model" student teacher instructional communications system as it operates during a "demonstration" lesson. Within this paradigm it was pointed out that a major defect in the operation of the instructional system was the high level of "noise" in the feedback signal arising from the general human limitations in storing and retaining complex verbal and non verbal information. Consequently, it was reasoned, that the incorporation of an electronic subsystem to overcome these limitations would increase the reliability of the entire system.

Related Research

Decades ago, some years after sound films had replaced silent films, A. S. Barr pointed out that here, at last, was the unusual tool needed for the study and improvement of teaching (8). For reasons still undetermined, no interest was shown in utilizing this tool as a teacher research and training instrument. Even with the advent of television and Kinescopes there was little insight into the potential of permanent sound and motion records of the complex and evanescent phenomenon of teaching. Some explanation and comparison of "new media" for the purpose of "observation" and "demonstration" of teaching performances had indeed occurred as in the studies of Keller (9), Fulton (10) and Follis (11). But as Carpenter indicated, "Psychologists and other behavioral scientists have yet to evaluate properly or to apply films and related 'media' as instruments of <u>control</u>" (12).

It is not surprising, then, that when this study was proposed in 1959, there were no prior studies of the use of video tape playback as a communication <u>and</u> control instrument for teacher <u>training</u> purposes. At about that time, however, two other proposals were accepted by the Office of Education which were considered somewhat similar to this study. At Hunter College, Schueler proposed the use of Kinescope recordings for "improving teacher-training and for improving measures of student teacher performance" (13). The experimental design compared three supervisory methods: an O method--supervision only via personal visitation of the teacher; AK method--supervision only via the use of Kinescope recordings; and an OK method--supervision via a combination of in-person visitation and Kinescope recordings. The major and underlying hypothesis was that "a student would make greater progress if he would observe his performance in Kinescope under the tutelage of a supervisor than he could through the discussion of his performance based on the supervisors and his own recollection." (No significant differences among methods were found.)

At Michigan State University, Tintera likewise investigated the use of Kinescope recordings for improvement of student-teacher training (14). The experimental design compared "three student teaching critique methods": 1. the conventional supervising teacher observation and conference, 2. the supervising teacher observation, supplemented by voice tape recordings followed by conferences using the recordings, 3. the supervising teacher observation followed by conferences in which the Kinescopes were viewed and discussed. (The hypothesis that performances of student teachers using Kinescope recordings would be superior to those of students not using them was not supported--"no statistically significant differences.")

The Hunter College and Michigan State University studies resembled our study in that they were concerned with the improvement of student-teacher performance and explored the use of sound-picture recordings

of the performances themselves as a likely means for increasing the effectiveness of post-performance discussions between methods experts and the student teachers. They differed from the latter in several respects which are worth noting.

In the former studies the theoretical basis for the use of Kinescopes is meager. The rationales as readily permit the use of the old standard movie camera as a television camera and Kinescope. The significant "end-product" is the sound film record for use as a memory aid in the conventional post-observation discussion between supervisors and student teachers. Finally, the full range of student teacher behavior during a half-hour or more of normal class teaching was recorded and subject to evaluation and improvement.

In contrast, in this study, for practical application of the explicitly described theoretical framework only a special purpose instrument such as the video tape recorder will serve. Other extant forms of sound-picture recording do not provide an immediately available record of the performance - the "hardware" translation of the theoretical concept of "immediate feedback" which is, narrowly defined, the true experimental variable of the study. The significant end-product is not the sound-film record but a machine aided instructional system or "training-device" in which a student teacher could experience the cycle of performance - video playback - analysis on a fairly continuous time line, i.e., without the time delays involved in film and Kinescope processing and projection. Finally, only a 5- to 7-minute segment of student teacher behavior, an introductory "single" topic lesson taught to a "simulated" class of no more than six pupils, was used as the unit of performance improvement.

Most closely related to the present study is the work begun more recently at Stanford University on "micro-teaching" (15). In its concern with the concept of "immediately" available feedback by means of the tape-recorder, its use of brief segments of teaching behavior (5-10 minutes) and of small "classes" (1-6 pupils), and in its general approach to the problems of student-teacher performance by means of a video tape aided continuous practice system of performance, playback, and analysis it appears to be a commendable development in which the present study was a crude beginning.

METHOD

Two experiments were conducted. In the first, a separate group of STs was used for each treatment, i.e., one group was given video tape feedback, the other, not. In the second experiment, the same group was used for both treatments, each subject acting as his own control, but treatments were also scheduled so as to permit comparisons between "early" and "late" users of video tape feedback.

The two experiments differed in another major respect. In the first, the MT after viewing the ST performance discussed it with each ST individually. In the second experiment, the MT answered questions raised in general class meetings from ST self-analysis of their performances but did not view or comment on any individual ST's performance. The use of the video tape in this case was essentially self-instructional.

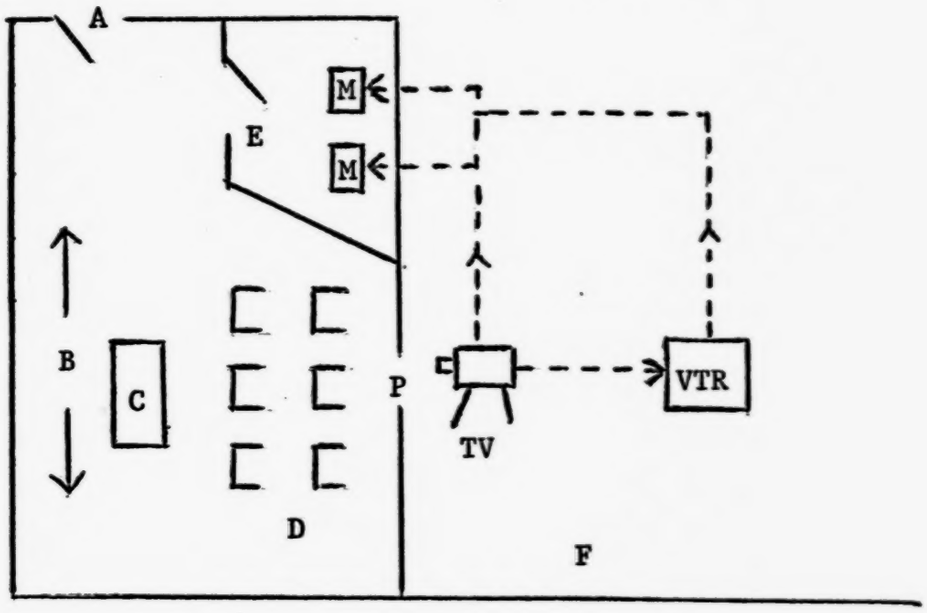
Experiment I

Design: This experiment was conducted with 6 MTs and 48 STs. The MTs covered the following areas: Art, English, Music, Spanish, Science and Social Studies. In each area, eight students were assigned at random to one of two treatment groups: video tape feedback (VT) and no video tape feedback (-VT). As a means of mitigating the Hawthorne effect, all STs were told they would be shown their taped performances but "because of scheduling reasons" some would see them the day they were taped, others at some subsequent time, and that the performances would be discussed by the MT when they were shown. STs presented their lessons to classes of pupils selected by randomization from the 7th and 8th grades of the local public schools.

Procedure: Each student was given brief standard instructions which differed only in the title of the lesson he was asked to prepare. (Appendix A) The titles were: Art-Perspective; English-Paragraphing; Spanish-Noun-endings; Music-Instruction on an Instrument; Science-Photosynthesis; Social Studies-The Presidential TV Image.

On a given day and time a MT met with his (her) ST at the studio classroom in the Radio and Television Center. In the studio-classroom, the ST found a class consisting of six pupils waiting for him. No one else was in the room but through a concealed panel

in an adjacent equipment room a TV camera was focused on the ST for recording on the video tape recorder. The general arrangement was approximately as shown below:



A	Entrance to classroom	F	Equipment Room
B	Blackboard	M	Monitors
C	Teachers Desk	P	Panel (concealed)
D	Student Seats	TV	Cameras
E	Observation-Review Room	VTR	Video Tape Recorder

Figure 4. Performance Arrangement

The MT was seated in the observation and review room (E) where he could monitor what was seen by the TV camera. At a given "ready" sign, (a signal light), the ST began his presentation. After about 5 minutes another light signal indicated he was to bring it to a close within two minutes.

Following the presentation, the ST joined the MT for a 10-minute discussion. If the ST was in the VT group of students, his performance was played back and viewed on the monitor. The MT could request as many replays of any particular portion of the record as he chose (but total time was limited to 10 minutes.)

During this interval, the first group of 6 pupils was ushered out of the classroom and a new group of 6 pupils was seated. When the ST emerged from the discussion session, he returned to the

studio-classroom and presented the same lesson again, trying to utilize the "feedback" he had just received. This lesson, too, was taped and then discussed for 10 minutes, ending the "trial" for that day. A week later this procedure was repeated.

ST's in the nonvideo tape feedback (-VT) group were treated in as similar a way as possible with the exception that during the 10-minute discussions, the MT could not request the video tape record of the performance.

The measuring instrument used to compare the performance of the VT and -VT groups was a rating sheet that had been developed in the following manner. A few examples of ST lesson presentations were recorded on film in each of the subject matter areas. Student classmates served as "pupils" for the ST. Subsequently, each MT was shown the example films in his area. The MT was asked to make believe the performance was "live," i.e., to stop the ST (the film) whenever he chose and to address the ST on the screen with such comments as he might ordinarily have made. The MT's comments were recorded on audio tape and later transcribed.

The following week the MT was again shown the films. A copy of the transcribed comments were given to the MT and at appropriate moments the film was stopped to discuss the comments made at that point. The discussion had as its objective the derivation of a set of rating items or categories. For example, remarks such as, "Don't mumble," The back of the room can't hear you," Don't drop your voice," were subsumed under the general category "voice."

The final instrument contained 29 items in three groups: verbal, nonverbal and procedural and dealing with vocabulary, grammar, pronunciation, rate of speech, voice, mannerisms, dress, grooming, facial expressions, gestures, bodily movement, poise, knowledge of subject matter, lesson developmental techniques, technical vocabulary, use of examples, use of blackboard, use of demonstration materials, interaction with students, overall class climate, and lesson organization. (Appendix B)

For each item a set of polar terms was established for the limits of a 7 point rating scale. After several preliminary training sessions, a reliability coefficient of 0.83 was obtained among 3 independent raters (MT) on a random sample of 3 recordings, using the intra-class correlation suggested by Ebel (8).

Results and Discussion: During the period of ST presentations, in addition to video taping those performances which were used for the VT group, the first and fourth performances of all students had been Kinescoped. The original plan was to have all performances in all subject areas rated by a group of MT at Indiana University and at other campuses. For the purpose of reporting on this study

at a meeting of the American Association for the Advancement of Science, (6), an analysis was made of the ratings by four campus MT's on the English films only. No significant differences were found at the 5% level of confidence between VT and -VT groups.

Among the many factors which could account for these results, two observations which developed during the experiment were noted in particular. The first dealt with the inter-trial interval. It will be recalled that there was an interval of 10 minutes between first and second trials, an interval of a week or more between second and third trials, and one of 10 minutes between third and fourth. It was our observation that there seemed to be a greater improvement in the performance of the VT group after a week's delay than in the one following the 10-minute discussion. There even appeared to be a decrease in quality of the latter performance. Consequently, the first and fourth comparison did not represent the maximum difference between the two groups: even the first and third might have been preferable. (More significantly, this effect, if correct, points to the importance of distinguishing between immediacy of feedback and immediacy of performance following feedback, suggesting that there exists an optimum relationship between the two--perhaps as a function of task complexity or cognitive versus motor involvement of the task.)

The other factor related to the content of the 10-minute discussion periods. It appeared that the periods with the VT group entailed less active discussion and contained many intervals of prolonged silence between MT and ST. This can readily be accounted for as both a concomitant of "searching" the video tape for points of correction and as the economy of verbalization arising from the availability of a pictorial record to which the MT could "point to" rather than describe. The latter factor is presumably the great advantage in pictorially aided communication, the factor which reduces the "noise" component of the discussion between MT and ST. Theoretically, the less talk required by the MT, the better. But this is true only if information is being provided pictorially. If in a brief 10 minutes a considerable portion was spent in "searching," it may very well be that the total information given the VT student is so much less than that given the -VT student (despite the high proportion of "noise" in the latter case) that it is ineffectual.

The results of the English film analysis, observations such as the above, consequent disatisfaction with the design of the experiment and scheduling exigencies prompted the discontinuance of further analysis and an attempt at a new experiment.

Experiment II

Design: This experiment was conducted with one MT in mathematics and 19 of his STs. Each subject served as his own control and was given five trials, each trial consisting of a 5-minute performance of an introductory lesson to "Exponents." The trial was followed by a 10-minute self-evaluation session and a uniform interval of one week before the next trial, thereby eliminating the effects of the variable intervals noted above.

STs were divided into two groups: early VT (EVT) and late VT (LVT). The former received VT feedback on its first and second performances, the latter on the third and fourth. All first, third and fifth performances were kinescoped. In addition to extablishing a three point "curve" of each ST's learning, this permitted comparison of ratings on the two groups of ST as shown below:

	GROUP	
	EVT	LVT
A.	3	3
B.	3	5
C.	5	3
D.	5	5

Fig. 5 Performance Comparisons

The A comparison was the only one in which the feedback variable was not confounded. The other comparisons, although ambiguous, held some potential for further hypothesizing about the effect of trials preceding and following video tape feedback.

In addition an attempt was made to reduce the effects of variable MT behavior. As mentioned in the discussion of the first experiment, the MTs had considerably more to say to the non-VT group. Other MT variables, e.g., attitude towards television, video tape recorders, experiments and consequent unconscious friendliness or hostility towards different students, constituted a considerable source of non-randomly distributed bias. To reduce this effect, only group contact with the MT was permitted, so that all STs were exposed to the same MT effects and STs acted as sole and self-evaluators of their performances.

Procedure: The STs were introduced to the experiment by the MT and were read the instructions. To train STs in the use of the rating instrument for self-evaluation, an experienced mathematics teacher from the University School gave sample performances in the methods class. These were discussed and rated immediately following each performance under the guidance of the MT.

Trials were conducted at the Radio and Television Center in much the same manner as in Experiment I, except without an MT. The ST met his class of 6 pupils in the studio classroom, was signaled when to begin and (at the end of 5 minutes) to "close." When he left the classroom, he adjourned to the review room. If the ST was scheduled for video tape feedback, he reviewed his performance using the rating items as a guide for self-evaluation. When the video tape was not made available to him he rated the "mental playback" of his performance as it was elicited by the rating items. (These items were the same as those used by the expert raters.)

During the regular classroom session with the MT, STs were encouraged to raise questions about the "meaning" of these items and the substance of their methods course in relation to their performances. The MT's answers were directed to the class as a whole and were the only components of total performance feedback which involved the MT. Thus, the video tape feedback system alone was essentially self-instructional.

Results-Discussion: Upon conclusion of the experiment, first, third and fifth performances were shown to two groups of raters: a group of three methods teachers of mathematics who taught at other universities in the state and the group of STs themselves. The same rating instrument was used as in the first experiment.

Analyses of covariance were performed to determine whether there was any evidence of an effect on later performances of the subject's viewing and rating his earlier video-taped performances. A single adjusting variable was used--viz., the sum of the judges' ratings of the very first of the five performances. It will be remembered that all subjects were treated alike prior to and including their first performance. The dependent variables were the sum of the judges' ratings of the subjects' third or fifth performances. The critical region of the F-distribution which was adopted corresponds to the 5% level of confidence. Separate analyses were performed for the two groups of raters.

It seemed advisable as a first step to determine which of the twenty-nine items comprising the instrument might have such low reliability as to warrant their exclusion from the analyses of covariance. To test the reliability of items, Ebel's intraclass correlation formula, (16), was used to determine the reliability of the average of the judges' ratings. It would be desirable to have one such reliability coefficient for each item. However, since ratings of separate performances presumably were not statistically independent, it was necessary in the case of each item to obtain a separate reliability coefficient for each of the three performances which were rated. Further, such reliability coefficients were obtained separately for student raters and expert raters. Finally, the 5% confidence interval was obtained for each reliability coefficient.

Table A shows for the student raters the reliability coefficients and their 5% confidence intervals. Table B shows these same data for the expert raters.

Table A. Intraclass correlation coefficients (r) and 5% confidence intervals (C.I.) for the separate items composing the rating instrument. The reliability is that of the average of the ratings by the student raters.

Item Number	r_1	r_1C.I.	r_3	r_3C.I.	r_5	r_5C.I.
1	.80	.53-.89	.60	.07-.78	.66	.21-.81
2	.77	.46-.87	.15	.00-.53	.50	.00-.73
3	.84	.62-.91	.59	.05-.78	.72	.35-.85
4	.00	-	.59	.04-.77	.65	.20-.81
5	.74	.40-.86	.16	.00-.54	.25	.00-.59
6	.93	.84-.96	.97	.93-.98	.88	.72-.94
7	.45	.00-.70	.67	.24-.82	.71	.32-.84
8	.67	.24-.82	.68	.26-.83	.48	.00-.72
9	.69	.28-.83	.72	.35-.85	.94	.86-.97
10	.09	.00-.50	.52	.00-.74	.89	.75-.94
11	.91	.80-.95	.11	.00-.52	.84	.63-.91
12	.83	.61-.91	.84	.62-.91	.77	.46-.87
13	.69	.28-.83	.65	.18-.81	.45	.00-.70
14	.89	.75-.94	.91	.78-.95	.87	.69-.93
15	.57	.00-.77	.61	.10-.79	.69	.28-.83
16	.56	.00-.76	.76	.44-.87	.67	.23-.82
17	.74	.40-.86	.73	.37-.85	.69	.28-.83
18	.64	.16-.80	.63	.14-.80	.71	.32-.84

(Continued)

Table A. (Continued) Intraclass correlation coefficients (r) and 5% confidence intervals (C.I.) for the separate items composing the rating instrument. The reliability is that of the average of the ratings by the student raters.

Item Number	r_1	r_1C.I.	r_3	r_3C.I.	r_5	r_5C.I.
19	.73	.37-.85	.67	.23-.82	.77	.48-.88
20	.72	.34-.84	.57	.01-.77	.70	.29-.83
21	.67	.24-.82	.57	.00-.76	.68	.25-.82
22	.52	.00-.74	.70	.29-.83	.71	.32-.84
23	.80	.54-.89	.64	.17-.80	.72	.35-.85
24	.04	.00-.48	.00	-	.20	.00-.56
25	.48	.00-.72	.58	.02-.77	.26	.00-.60
26	.97	.93-.98	.70	.29-.83	.98	.94-.99
27	.95	.89-.97	.66	.20-.81	.94	.87-.97
28	.77	.46-.87	.70	.31-.84	.79	.51-.88
29	.73	.36-.85	.46	.00-.71	.35	.00-.64

Table B. Intraclass correlation coefficients (r) and 5% confidence intervals (C.I.) for the separate items composing the rating instrument. The reliability is that of the average of the ratings by the expert raters.

Item Number	r_1	r_1C.I.	r_3	r_3C.I.	r_5	r_5C.I.
1	.65	.18-.81	.09	.00-.41	.46	.00-.70
2	.70	.30-.84	.34	.00-.64	.09	.00-.50
3	.77	.47-.88	.67	.23-.82	.70	.29-.83
4	.62	.12-.79	.60	.08-.78	.73	.36-.85
5	.85	.64-.92	.75	.41-.86	.81	.57-.90
6	.79	.50-.88	.72	.36-.85	.82	.59-.90
7	.87	.70-.93	.73	.38-.85	.72	.35-.85
8	.78	.48-.88	.67	.24-.82	.63	.13-.80
9	.75	.43-.87	.65	.19-.81	.64	.17-.80
10	.64	.16-.80	.60	.06-.78	.62	.12-.79
11	.70	.30-.84	.83	.60-.90	.83	.60-.90
12	.87	.69-.93	.80	.54-.89	.82	.57-.90
13	.39	.00-.69	.69	.27-.83	.68	.26-.83
14	.08	.00-.50	.52	.00-.74	.49	.00-.72
15	.66	.22-.82	.52	.00-.74	.81	.56-.90
16	.75	.42-.86	.55	.00-.75	.67	.24-.82
17	.81	.55-.90	.85	.66-.92	.79	.51-.88
18	.31	.00-.62	.21	.00-.34	.33	.00-.63
19	.76	.45-.87	.52	.00-.74	.64	.16-.80

(Continued)

Table B. (Continued) Intraclass correlation coefficients (r) and 5% confidence intervals (C.I.) for the separate items composing the rating instrument. The reliability is that of the average of the ratings by the expert raters.

Item Number	r_1	r_1 C.I.	r_3	r_3 C.I.	r_5	r_5 C.I.
20	.70	.30-.84	.55	.00-.75	.73	.38-.86
21	.66	.22-.82	.46	.00-.70	.55	.00-.76
22	.62	.12-.79	.50	.00-.73	.30	.00-.62
23	.45	.00-.70	.44	.00-.70	.51	.00-.73
24	.00	-	.00	-	.27	.00-.31
25	.57	.01-.77	.44	.00-.69	.48	.00-.72
26	.54	.00-.75	.70	.31-.84	.74	.38-.86
27	.80	.54-.89	.80	.54-.89	.79	.50-.88
28	.59	.04-.78	.28	.00-.61	.62	.12-.79
29	.69	.27-.83	.56	.00-.76	.67	.22-.82

On the basis of aspects of the data in these tables, the decision was made to eliminate from the analyses of covariance all but the following: (a) for the student raters, items 6, 9, 12, 14, 17, 18, 19, 23, 26, 27, and 28; and (b) for the expert raters, items 3, 5, 6, 7, 8, 9, 11, 12, 17, 27. Retained were those items each of whose three correlation coefficients was equal to or greater than 0.63.

It is of some interest to note that in general the correlation coefficients for a particular item varied considerably from one performance to another. In keeping with this is the fact that the confidence intervals generally covered a wide range. The fact that the two groups of items retained for the two groups of raters have only about half of their items in common--a clear cut difference in "vocabulary"--is an expression of the ST-MT communication problem which this study could not overcome.

More than a hundred analyses of covariance were made. The 5% critical region was adopted. In the case of each group of raters analyses were made: (1) separately for each item on the rating instrument, (2) for the group of items designated as "verbal", (3) for the group of items designated "non-verbal", (4) for the group of items designated "procedural" and (5) for the entire group of items. Further, in the case of each of these categories, the following major comparisons were made: (1) each ST's first performance with his later performances, (2) the third performances of the two groups of STs, (3) the third performance of the "early" group with the fifth performance of the "late" group, (4) the fifth performance of the "early" group with the third performance of the "late" group, and (5) the fifth performances of the two groups. Although most of these comparisons involved the confounding of variables, the results might have been of interest regardless of the ambiguity involved in their interpretation.

Of the many analyses, only one resulted in a significant F. This one instance of significance was in the case of comparing the two experimental groups third performance with respect to ratings by experts on a single item. Since this one significant F among so many F's computed may be most plausibly explained as being due to chance, it will not be discussed further. We may say that there is no evidence that this system of feedback improved individual ST performance or that procedural differences between the groups resulted in their being rated differently by either the student raters or the expert raters.

SUMMARY - CONCLUSIONS

This study hoped to contribute to the development of the technology of education by analyzing one of the problems of communication between methods teachers and student teachers and by devising a machine-aided system for its reduction.

A small segment of methods teacher-student teacher interaction was chosen for study. Its focus was the criticism and improvement of the presentation of the "short lesson" which is a common assignment in methods classes.

The approach to the study was based on a cybernetic paradigm which indicated it would be desirable to increase the reliability of feedback to the student teacher and make it available to him immediately after his performance. The use of an electronic subsystem incorporating a video tape recorder which provided immediate feedback would overcome some of these limitations and would increase the reliability of the entire system.

Two studies were done: one, in which the methods teacher was directly involved in the interpretation of each video taped record; the other, in which the methods teacher's separate involvement with each student teacher was eliminated, i.e., in which an attempt was made to make the system self-instructional.

The first study was conducted with 6 methods teachers and 48 student teachers in the areas of Art, English, Music, Spanish, Science and Social Studies. In each area, students were assigned at random to either a VT or -VT group. A student teacher of the VT group reviewed the video tape record of a "demonstration" lesson he had just presented with his methods teacher. A student teacher of the -VT group had the conventional post-presentation verbal feedback. The lessons were presented to a "simulated" class of six pupils selected by randomization from the 7th and 8th grades of the local schools. Each student teacher was given a total of four trials, the first three with feedback (VT or -VT). All first and fourth trials were permanently recorded as Kinescopes for eventual evaluation by expert raters - methods teachers from other state colleges and universities.

A rating sheet developed from audio-taped critiques by university methods teachers of filmed sample student teacher performances was used as the "measuring" instrument. It contained 29 items in three categories (verbal, non-verbal, and procedural) which referred to vocabulary, grammar, pronunciation, rate of speech, voice, mannerisms, dress, grooming, facial expressions, gestures, body movements, poise, knowledge of subject matter, lesson developmental techniques, technical vocabulary, use of examples, use of blackboard, use of

demonstration materials, interaction with pupils, overall classroom climate and lesson organization. As a result of an analysis which showed no statistically significant differences between VT and -VT groups, dissatisfaction with some of the obvious sources of error and scheduling exigencies, further study of this system was discontinued and a number of modifications were explored.

The second study involved one methods teacher and 19 of his student teachers. To reduce the effects of uncontrolled methods teacher's behavior, only group contact between student teacher and methods teacher was permitted, i.e., individual post-performance discussions were eliminated. Student teachers raised questions about their video tape playbacks during the regular classroom sessions. Each student teacher was the only one to see his video taped playback and was his own critic and rater at that time.

The number of trials was increased to five and scheduling of trials following immediately upon the heels of the video tape feedback session was eliminated. Instead, a uniform interval of one week between trials was established.

Student teachers were divided into two groups: one which received video tape feedback in its first and second trials (ETV), the other which received its video tape feedback in the third and fourth trials. By Kinescoping all first, third and fifth performances for post-experimental rating by "judges," a variety of analyses of individual and group learning was made possible.

The Kinescopes were rated separately by two groups of judges, using the same instrument as in the first study. One group consisted of three methods teachers who taught at other Indiana colleges. The other group consisted of the student teachers themselves. The reliabilities of the separate items were determined and covariance analyses were run with selected items of relatively high reliability coefficients. Analyses were made of each student teacher's initial performance with his later performances, and of parallel and cross combinations of third and fifth group (ETV and LTV) performances. No significant differences were found in the many comparisons.

In view of the lack of significant analyses, no lengthy elaboration of conclusions inferred from them is warranted. The effects of reliable, "high fidelity" records of performance and of opportunity to practice a relatively simple task repeatedly on the basis of the information presumably available in those records could not be shown to exist in this study despite unequivocal results of laboratory results to the contrary (17).

The first and easiest way to account for these results is to deplore the measuring instrument itself. Unfortunately it is undeniably

clear now that many aspects of its development and use should have been more carefully executed. Rather naively, we hoped that the reliability and replicability provided by the video tape would overide the recognized shortcomings of the rating sheet. We should have known better in face of the overwhelming preponderance of "no significant differences" in comparative methods study of this kind. On the other hand, we could not have hoped to construct a better instrument than the one developed for the Hunter College project (described in Related Research) by the authors of "Measuring Classroom Behavior by Systematic Observation" in the *Handbook of Research on Teaching* (18): yet, in that study, their instrument failed to measure those differences which, as in our study, were hypothesized to arise as the results of Kinescoped performance records.

It seems likely, therefore, that despite the availability of devices such as video tape recorders which seem to provide the technological means for "obvious" improvement of educational practice, valid proof of the obvious is not to be gained through experimental comparison of gross "methods." In such studies, the problem of how to get from the act of seeing a teaching performance to an instrument for measuring it, will probably remain the critical obstacle in the foreseeable future, for involved in it is even the more difficult and prior task of evolving a valid theory of teaching within which the act of "seeing" will have quantifiable, controllable and predictable dimensions. In the interim, however, one cannot ignore the immediate practical applications of educational "hardware."

For the practical purpose of this study it was therefore a mistake, in the first place, to do it within an experimental rather than a developmental framework. Factors other than the measuring instrument mitigated against it as can readily be discerned: insufficient numbers of student teachers; unavailability of time to prepare and train methods teachers with respect to the requirements of experimental behavior; inexperience in teacher education experimentation and the administrative obstacles related thereto; our over-simplified paradigm of "feedback" and conflict between "basic" and "applied" orientation towards the execution of the study, etc. It would consequently not be valid to generalize about the significance of video tape feedback or the use of video tape recorders in student teaching from this study.

Fortunately, practical educators ignore not only valid research findings, but invalid ones as well. It would appear that no-significant-difference results of this study and others have not discouraged the use of the video tape system in student teacher training. On this campus it may even have stimulated it, for in its latest teacher training program, Instructional Systems in Teacher Education (INSITE), the School of Education includes three video taped feedback sessions for which "the students will have

major responsibility for self-evaluation and analysis." The rationale is accepted that "there is presently no better way by which the student teacher can be both teacher and observer simultaneously than when reviewing the video tape."

For the researcher, however, the tasks of seeking to know <u>why</u> this may be true and, then, how even better ways <u>may</u> be devised, remain.

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APPENDIX A

41-600-88

Instructions To Methods Students

How would you like to be a great television star? Well, this term you'll be privileged to make a step in that direction. You will be able to see what you "look like" as a teacher on television.

We are now engaged in a study for improving the means of communication between methods teachers and student teachers. By participating in this study, this preview of yourself as a television teacher will be an indirect reward. A more direct reward however, and the primary benefit of the study to you, will be the learning you derive from the task which will be assigned to you.

This task will not differ greatly from one which is generally assigned in your methods class. To be specific, you will be assigned to prepare and present a five-minute lesson. In preparing this lesson you may assume that you will be free to use the blackboard or demonstration materials. You may also assume that you will have serious students upon whom you may call to ask questions or participate in the customary manner. On a given day and time, you will actually present this lesson.

What has this to do with television? Well, we will not be televising your presentations, but we will be making use of certain television facilities. Your presentation will be made in studio C at the Radio and Television Center, 5th and Jordan. There will be no one in the studio but yourself and a small group of students. You will be observed by your methods teacher, however, by means of a closed circuit television monitor in an adjoining room. Following the presentation, you will join your methods teacher in an adjoining room while your students remain in the studio. Your performance will be discussed with you for approximately 10 minutes. Depending on the circumstances and the time, you will either have a video tape record immediately available to look at while you are discussing your performance, or you may not have this record available until some time afterwards. Following your discussion you will return to your studio class immediately and repeat your presentation. After the second presentation you will again join your methods teacher for discussion. This will end the first half of your task.

One week later you will work with your methods teacher in exactly the same way giving two more presentations of the same lesson. If you had not as yet been shown your video tape performance, you will see it at the end of your fourth performance. This will complete your task in the study.

Note: If you are going to use demonstration materials, prepare beforehand those which might cause you to require more than five minutes for your presentation.

APPENDIX B

Student Teacher Evaluation

41-600-88

Kinescope Number_____

Name of Rater_____ Date_____

	Yes ——— No
1. VOCABULARY: Were there better words and expressions the student teacher could have used?	3 2 1 0 1 2 3
2. GRAMMAR: Did the student teacher make any grammatical errors?	3 2 1 0 1 2 3
3. PRONUNCIATION: Did the student teacher pronounce his (her) words clearly and carefully?	3 2 1 0 1 2 3
4. RATE OF SPEECH: Did he (she) talk at a proper rate, neither too quickly nor too slowly?	3 2 1 0 1 2 3
5. VOICE: Did the student teacher speak smoothly, fluently?	3 2 1 0 1 2 3
6. VOICE: Was his (her) voice strong enought for all the students to hear easily?	3 2 1 0 1 2 3
7. VOICE: Was the student teacher's voice interesting in inflection and emphasis?	3 2 1 0 1 2 3
8. MANNERISMS: (verbal) Did he (she) exhibit any distracting verbal mannerisms, e.g., frequent use of an expression such as "that's swell."	3 2 1 0 1 2 3

		Yes						No
9.	DRESS: Were the student teacher's clothes appropriately formal?	3	2	1	0	1	2	3
10.	GROOMING: Did he (she) look "neat"?	3	2	1	0	1	2	3
11.	EYE CONTACT: Did the student teacher maintain "eye contact" with the students in the class?	3	2	1	0	1	2	3
12.	FACIAL EXPRESSIONS: Did the student teacher use "facial expressions" for rapport with the class?	3	2	1	0	1	2	3
13.	GESTURES: Did the student teacher use gestures to help express his (her) ideas?	3	2	1	0	1	2	3
14.	MOVEMENT: Did he (she) move about the front of the room excessively?	3	2	1	0	1	2	3
15.	MANNERISMS: Did he (she) exhibit any non-verbal mannerisms, e.g., chalk-tossing, that are distracting?	3	2	1	0	1	2	3
16.	POISE: Did the student teacher appear ill-at-ease?	3	2	1	0	1	2	3
17.	PERSONALITY: Did the student teacher express himself (herself) in a "lively" manner?	3	2	1	0	1	2	3
18.	KNOWLEDGE OF SUBJECT MATTER: Did he (she) need more knowledge of the subject matter in this lesson?	3	2	1	0	1	2	3

	Yes						No
19. DEVELOPMENTAL TECHNIQUES: Was his (her) presentation developed smoothly from point to point?	3	2	1	0	1	2	3
20. LEVEL OF TECHNICAL VOCABULARY: Was the technical vocabulary "over the head" of the student?	3	2	1	0	1	2	3
21. DEFINITION OF KEY TERMS: Did the student teacher define the technical terms introduced in this lesson?	3	2	1	0	1	2	3
22. EXAMPLES: Did the examples chosen illustrate the important points?	3	2	1	0	1	2	3
23. USE OF BLACKBOARD: Did the student teacher use recommended procedure for writing and speaking while using the blackboard?	3	2	1	0	1	2	3
24. USE OF DEMONSTRATION MATERIALS: Could he (she) illustrate graphically with models what was difficult to explain verbally?	3	2	1	0	1	2	3
25. INTEGRATIONS: Did the student teacher "tie in" with student's prior knowledge?	3	2	1	0	1	2	3
26. INTERACTIONS: Were the students involved in developing the lesson?	3	2	1	0	1	2	3
27. OVER-ALL CLASS CLIMATE: In general, did the student teacher make the student feel comfortable in expressing himself?	3	2	1	0	1	2	3

	Yes	No
28. OVER-ALL ORGANIZATION OF LESSON:	3 2 1 0 1 2 3	
In general, was the lesson well organized?	_ _ _ _ _ _ _	
29. OVER-ALL PERFORMANCE:	3 2 1 0 1 2 3	
In general, was this a good performance?	_ _ _ _ _ _ _	

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100 TITLE
101 Improving the Quality of Teacher Performance by the Use of the
102 Video Tape Recorder
103

200 PERSONAL AUTHOR(S)
Henry A. Bern

300 INSTITUTION (SOURCE) — SOURCE CODE
Indiana University

310 REPORT/SERIES NO.

320 OTHER SOURCE — SOURCE CODE

330 OTHER REPORT NO.

340 OTHER SOURCE — SOURCE CODE

350 OTHER REPORT NO.

400 PUB'L. DATE 12-24-67 — CONTRACT/GRANT NUMBER 7-12-039

500 PAGINATION, ETC.
501 35 pages

600 RETRIEVAL TERMS
601
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607 IDENTIFIERS

800 ABSTRACT

801 Problem-Purpose: At the practical level, the problem was how to enable a stu-
802 dent teacher (ST) to improve his teaching of a five-minute "sample" lesson;
803 the purpose was to test two video tape recorder-aided methods of providing
804 "immediate feedback" to the ST to so enable him.
805 Conceptual Framework: A cybernetic paradigm was described in order to provide
806 some analogical validity to the construct of "feedback" and to the consequent
807 hypothesis that the video tape (VT) feedback in the system would improve ST
808 performance.
809 Method: Two experiments were conducted: In the first, 24 students received
810 VT feedback immediately after each of three video taped trial performances.
811 Another group of 24 students were not shown video tape recordings of their
812 performances. A group of three judges (methods teachers) rated the test
813 (fourth) performances of both groups. ¶ In the second experiment,
814 nineteen students were divided into "early" and "late" feedback groups: the
815 former receiving VT feedback during the first three of five trials, the
816 latter, during the third through fifth trials. A variety of comparisons were
817 made of the performances at different trials based upon ratings made by
818 judges and student teachers themselves.
819 Results: In general no statistically significant differences were found.
820 Conclusions: The statistical results permit no expression of confidence in
821 the significance of VT feedback. The execution of the study was full of
822 "holes," however, and consequently further development is called for.